California Regional Water Quality Control Board
Santa Ana Region

November 18, 2005

Item: **15**

Subject: **RESULTS OF ANNUAL WATER QUALITY SAMPLING FOR THE YEAR 2004 – SANTA ANA RIVER BELOW PRADO DAM**

Summary:

The Basin Plan specifies water quality objectives applicable to Reach 3 of the Santa Ana River (River) for total dissolved solids, total nitrogen, and other constituents. To determine compliance with these objectives, the Basin Plan requires that sampling of the River be conducted annually at Prado Dam during base flow conditions when the quantity and quality of baseflow is most consistent. Regional Board staff conducted the year 2004 sampling over a four-week period during August and September. The results of the baseflow sampling program indicate that the River at base flow is meeting Basin Plan objectives for all constituents.

Stream flow at Prado Dam during the sampling period ranged from 158 to 235 cubic feet per second (cfs) and averaged 181 cfs.

The Basin Plan also specifies water quality objectives for Reaches 2, 4 and 5 of the Santa Ana River. Compliance with these objectives is determined by analyzing data collected by the US Geological Survey (USGS), the Santa Ana River Watermaster and Orange County Water District (OCWD). Data collected and analyzed by these other agencies indicate that water quality objectives for the Santa Ana River Reaches 2, 4 and 5 were met during 2004.

The recently adopted Total Dissolved Solids/Nitrogen Basin Plan amendment requires responsible Nitrogen/TDS Task Force agencies to provide an annual report of compliance with relevant Santa Ana River water quality objectives. This evaluation of compliance with Basin Plan objectives was performed by Wildermuth Environmental, Inc (WEI), and is summarized in the report, "Annual Report of Santa Ana River Water Quality, Final Report", June 2005. This staff report will focus on compliance with the Santa Ana River Reach 3 baseflow objectives; compliance with Reaches 2, 4 and 5 water quality objectives is evaluated in the WEI report.

Background:

The Santa Ana River is the major source of recharge to the Orange County groundwater basin. The Basin Plan specifies certain water quality objectives applicable to Reach 3 of the River (Mission Boulevard in Riverside to Prado Dam) during base flow. The intent of these objectives is to protect the River's groundwater recharge beneficial use. Compliance with these objectives is verified by annual measurement of the base flow quality. Base flow is composed of wastewater discharges, non-point source discharges and rising ground water. Storm flow is not a component of base flow, therefore, the River is sampled during the time of the year (August or

September) when the influence of storm flow is at a minimum.[1] The results of this monitoring program are used to assess the effectiveness of the Board's regulatory programs and to determine whether changes, such as revisions to the TDS and nitrogen wasteload allocations are necessary.

Methods:

The sampling program was carried out weekly during the months of August and September 2004. Each week, an ISCO[2] sequential sampler was deployed to automatically collect a 24-hour composite sample from the River. The composite sample was then analyzed for mineral analyses, including total dissolved solids (TDS), chloride, sulfate, boron, hardness and electrical conductivity (EC). In addition, three grab samples were collected during the 24-hour period and analyzed for nutrients, chemical oxygen demand (COD) and total organic carbon (TOC).

Water temperature, dissolved oxygen, pH and EC were measured in the field using a YSI[2] multi-parameter probe each time a grab sample was collected. These measurements were made with calibrated field equipment. Stream flow measurements were obtained from the U.S. Geological Survey after the sampling program was completed.

Results and Discussion:

2004

The Prado Dam results for August 2004 for the mineral constituents are tabulated in Table 1. The results presented in Table 1 indicate that all mineral parameters were below their respective Basin Plan objectives. The grab sample results and the field measurements are tabulated in Table 2. The total nitrogen concentrations ranged from 4.7 to 7.1 mg/l, with an average concentration of 6.0 mg/l. These results are significantly lower than the Basin Plan objective of 10 mg/l. COD concentrations ranged from less than 10 mg/l to 23 mg/l, with an average concentration of 16.0 mg/l. The average and the individual concentrations for COD were below the Basin Plan objective of 30 mg/l.

1983 –2004

Table 3 summarizes the yearly averages of various constituents along with their respective water quality objectives over time for the Prado Dam sampling program. The data indicate that the water quality of Reach 3 of the Santa Ana River for these parameters continues to improve. Graphs depicting the 1983 –2004 data for total nitrogen and TDS that are tabulated in Table 3, are shown in Figures 1 and 2, respectively. Of particular interest are the total nitrogen

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[1] In setting the base flow objectives, it was assumed that storm flows that recharge the Orange County groundwater basins would improve the quality of that groundwater. It was also recognized that there could be no assurance that such storm flows would occur each year. Therefore, it was imperative to control base flow quality such that under these worst case conditions (no high quality storm flows), Orange County groundwater quality would remain protected.

[2] Mention of trade names does not imply endorsement of these products.

concentrations from 1983 to 2004, depicted in Figure 1. In recent years (1998-2004), total nitrogen concentrations have been consistently below the Basin Plan objective; 2004 results for total nitrogen are also consistent with this trend. This may be due to a number of factors including improvements in the wastewater nitrogen discharges as a result of the Regional Board nitrogen control strategies. In addition, both the OCWD and the City of Riverside operate wetland treatment facilities that serve to reduce nitrogen levels in the River and in the City's wastewater effluent.

TDS concentrations over time are shown in Figure 2. TDS concentrations continue to decrease from the elevated concentrations measured in the early 1980s, likely due to water supply improvements.

Conclusion:

The results of the 2004 Prado Dam sampling program indicate overall compliance with the Basin Plan objectives. Unlike previous years, the data for COD suggest a decline to concentrations that are well below the Basin Plan objective.

TABLE 1

SANTA ANA RIVER BELOW PRADO DAM
2004 GRAB SAMPLE RESULTS

Sample number	Date	Time0	Discharge (cfs)	Electrical Conductivity (umhos/cm)	Total Organic Carbon (mg/l)	Total Nitrogen (mg/l)	Chemical Oxygen Demand (mg/l)
SAR083104-1	08/31/2004	1150	178	950	6.1	5.5	16
SAR083104-2	08/31/2004	1400	-	940	6.0	5.6	16
SAR090104-1	09/01/2004	1524	178	910	5.8	6.1	18
SAR090704-1	09/07/2004	NR	180	910	5.5	5.8	14
SAR090704-2	09/07/2004	NR	-	890	5.8	5.4	<10
SAR090804-1	09/08/2004	1520	180	890	5.5	6.1	16
SAR091404-1	09/14/2004	1115	173	990	4.6	5.8	<10
SAR091404-2	09/14/2004	NR	-	980	4.2	5.5	<10
SAR091504-1	09/15/2004	1525	176	1000	4.2	6.4	12
SAR092104-1	09/21/2004	1104	196	940	4.4	6.6	23
SAR092104-2	09/21/2004	1320	-	940	5.1	6.8	18
SAR092204-1	09/22/2004	1308	235	NR	6.9	4.7	23
SAR092804-1	09/28/2004	1102	160	990	4.6	7.0	21
SAR092804-2	09/28/2004	1328	-	970	4.7	7.1	21
SAR092904-1	09/29/2004	1157	158	NR	5.5	6.6	18
Average			***181***	***946***	***5.2***	***6.0***	***16***
Basin Plan Objective				-	-	***10***	***30***

NR = Not recorded

TABLE 2

SANTA ANA RIVER BELOW PRADO DAM
2004 MINERAL RESULTS

Sample number	Date	Sample Type	pH	TDS (mg/l)	Boron (mg/l)	Hardness (mg/l)	Sodium (mg/l)	Chloride (mg/l)	Sulfate (mg/l)
SAR090104-2	09/01/2004	Composite	8.2	610	0.29	270	95	100	93
SAR090804-2	09/08/2004	Composite	8.0	570	0.28	240	97	110	100
SAR091504-2	09/15/2004	Composite	8.1	640	0.30	260	100	110	120
SAR092204-2	09/22/2004	Composite	8.1	530	0.25	210	85	96	88
SAR092904-2	09/29/2004	Composite	8.1	610	0.29	230	100	110	110
Average	---	---	***8.1***	***592***	***0.28***	***242***	***95.4***	***105***	***102***
Basin Plan Objective	---	---		***700***	***0.75***	***350***	***110***	***140***	***150***

TABLE 3

SANTA ANA RIVER AVERAGE RESULTS FOR 1983 – 2004 DURING BASE FLOW

Year	Discharge (cfs)	TDS (mg/L)	Total Hardness (mg/L)	Sodium (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Boron (mg/L)	Total Nitrogen (mg/L)	COD (mg/L)	TOC (mg/L)
1983	213	716*	356*	91	85	NA	0.30	8.2	86*	NA
1984	128	683	350*	96	116	159*	0.40	7.3	58*	NA
1985	138	682	339	96	115	150*	0.33	9.8	33*	NA
1986	123	656	290	98	110	127	0.25	10.2*	43*	NA
1987	132	641	323	97	97	134	0.45	10.2*	27	NA
1988	134	629	297	102	111	130	0.25	10.3*	38*	NA
1989	127	635	290	102	115	128	0.30	10.2*	31*	9.9
1990	131	640	289	107	117	128	0.36	11.9*	26	9
1991	124	648	281	89	101	114	0.36	10.9*	18	5.3
1992	136	617	282	98	110	108	0.36	10.6*	18	4.9
1993	130	672	288	99	125	128	NA	8.2	30*	NA
1994	119	629	286	101	114	140	0.38	8.6	40*	5.5
1995	141	636	276	91	103	104	0.28	7.5	27	4.8
1996	168	578	250	88	97	106	0.27	9.5	22	5.4
1997	149+	607+	218+	89+	99+	112+	0.36+	6.3+	NA	9.7+
1998	245	524	264	85	96	100	0.30	7.4	30@	4.7
1999	190	586	271	99.5	101	110	0.341	6.3	30*	4.8
2000	186	562	251	105	107	105	0.321	6.7	15	4.7
2001	192	631	276	96.7	109	99	0.334	6.08	14	5.1
2002	356	497	228	97.0	103	92	0.317	4.32	13	6.1
2003	193	596	254	94.2	108	93	0.28	4.8	12	5.0#
2004	181	592	242	95.4	105	102	0.28	6.0	16	5.2
Basin Plan Objective		***700***	***350***	***110***	***140***	***150***	***0.75***	***10***	***30***	**-**

* -- value equals or exceeds Basin Plan objective
\+ -- 1997 calculated results
@ -- value is for unfiltered sampled – not to be compared with COD Basin Plan objective
NA -- not analyzed
\# -- average of only 5 samples

Figure 1
Annual Average Total Nitrogen Concentrations

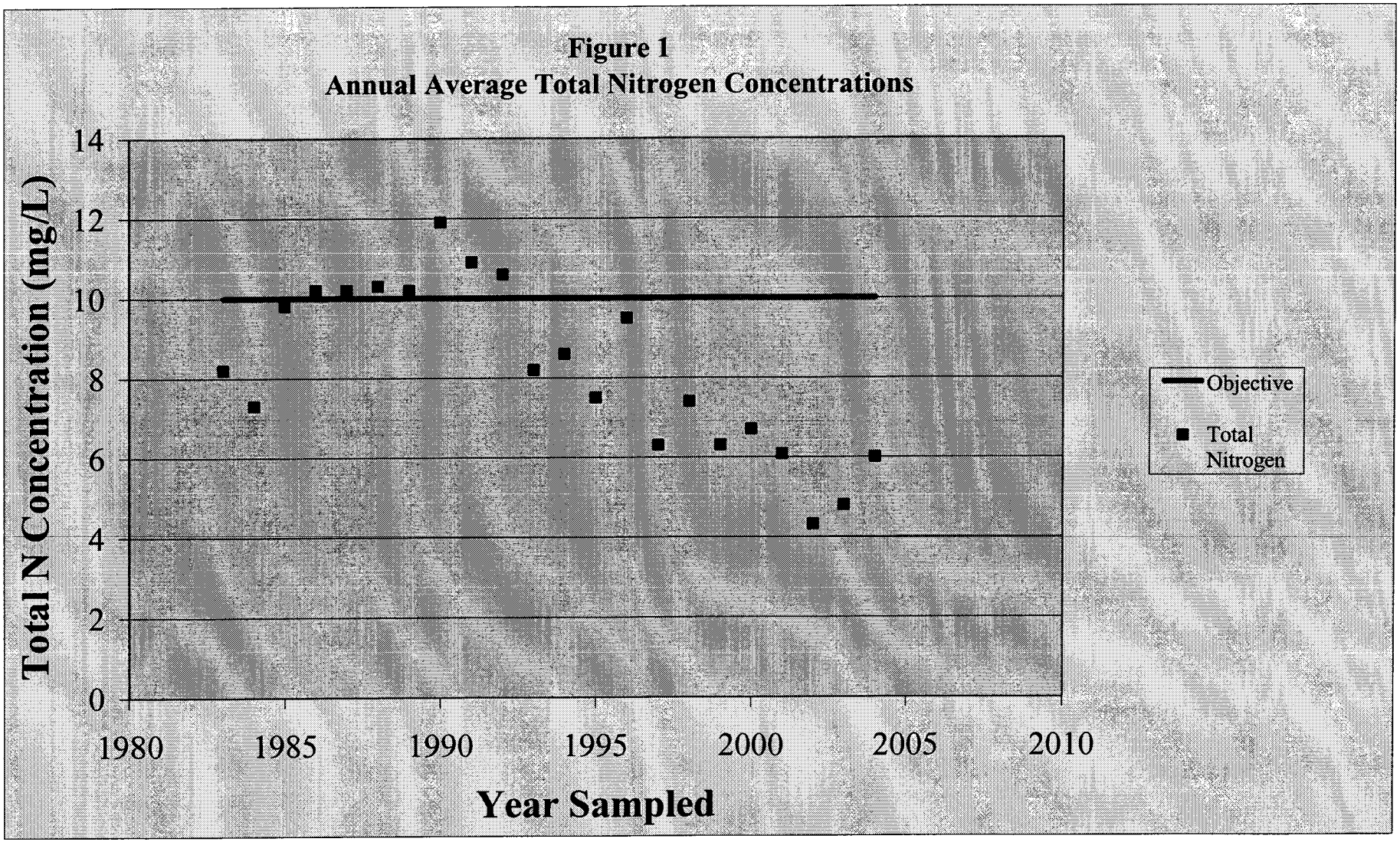

Figure 2
Annual Average TDS Concentrations